

July 29, 1994

CD-94-13 (LDV,LDT,ICI,SM)

Dear Manufacturer:

Subject: Alternative Durability Guidance for MY94 through MY98¹

The purpose of this letter is to provide manufacturers with additional guidance regarding the 1994-98 model year Alternate Service Accumulation Durability Program (ASADP) which is the Agency' 8 preferred method of demonstrating durability for current certification programs. The regulations applicable to 1994-1998 model years alternative durability programs are found in 40CFR 86.094-13 "Light-Duty Exhaust Durability Programs."

To date, nine manufacturers have either certified or are in the process of certifying engine families using ASADPs. Two types of ASADPs have been used. One involves the use of a whole vehicle mileage accumulation cycle, with speeds greater than those contained in EPA's standard AMA mileage accumulation cycle. The second type of ASADP involves testing a vehicle equipped with artificially aged emission control system components.

Eased on our experience negotiating with these manufacturers to develop acceptable alternate durability programs, we have developed the attached documents which are intended to serve as guidance for manufacturers wishing to participate in these programs. It should be emphasized that each alternate durability program is negotiated between EPA and the manufacturer. The attachments serve as examples based on these negotiations. Manufacturers may have need to negotiate programs which differ from the situations covered in the attachments. Attachment I provides guidance on the up-front information that EPA will ask for prior to ASADP approval. Attachment II provides an outline of an acceptable in-use verification "reality check" program. Attachment III is a sample questionnaire which could be used to procure in-use test vehicles for the reality check.

The guidance provided in this letter is not applicable to 1999 and later model years because, as you know, the Agency is in the process of developing new durability regulations for those model

¹59 FR 36368, July 18, 1994, extends the 1994-96 model year ASADP regulations to the 1997 and 1998 model years, effective September 16, 1994.

years. Items under discussion for the 1999 model year include the elimination of the current light-duty truck "manufacturer-determined" durability program, a revised EPA standard mileage accumulation cycle, and additional ASADP guidance. Questions about the ongoing durability rulemaking should be addressed to Mr. Jim McCargar at (313) 668-4244.

If you have additional questions about this letter or any of the attachments, please contact your certification team representative.

Sincerely,

Robert E. Maxwell, Director
Certification Division
Office of Mobile Sources

Enclosures

Attachment I

ALTERNATIVE DURABILITY PROCESS INFORMATION REQUIRED FOR INITIAL EPA APPROVAL

The following information should be supplied to EPA with each initial request for approval of an Alternative Service Accumulation Durability Procedure (ASADP). While the ASADP regulations are applicable to all types of engine families, this guidance was primarily developed for the certification of gasoline-fueled vehicles by OEM manufacturers, and is intended to expedite EPA's review of specific ASADP proposals. Supplementary information may also be required.

1. Applicability

Manufacturers should provide a list of the engine families, durability-data vehicles (DDV's), and vehicle models that will be certified using the ASADP. The sales area applicability should be included (e.g. 49-state, 50-state, or California-only).

2. General Descriptions of ASADP

Manufacturers may propose service accumulation methods based upon whole-vehicle mileage accumulation, bench aging of individual components or systems, or a combination of the two approaches.

A full description of the proposed ASADP cycle and/or aging techniques is required. For whole vehicle mileage accumulation this description should include a speed-time trace of the ASADP cycle, the acceleration rates of the cycle, and testing points for the DDV. For bench aging

ASADPs the description should include the initial baseline documentation (road cycle if applicable) used as the basis for the accelerated bench aging cycle, a description of the bench aging cycle, how the bench aging time required for 100K miles is determined, and the testing points for the DDV.

A discussion of the method used to calculate the deterioration factor (DF) should also be submitted. The discussion should include an example calculation. EPA is prepared to accept ASADPs which use either additive or multiplicative DFs.

3. In-Use Data

Manufacturers should supply some type of actual in-use data which either directly measures the rate of whole vehicle emission deterioration, degradation of catalyst efficiency, cumulative catalyst temperature exposure with a method of evaluating this data in terms of emission deterioration, or some similar deterioration related information. EPA prefers that the in-use data is collected on current technology vehicles representing the

breadth of the manufacturer's product offering and be based on as-received testing (no vehicles screened from the data set) spanning the useful life of the vehicle. EPA will work with manufacturers to use existing data to the maximum extent possible. When submitting data, describe the source of the data including any screening done and the engine families and model years represented. The actual test data points and an analysis of the data should be submitted.

Similar data should also be collected from vehicles which have completed the proposed ASADP cycle or bench aging procedure. Projections of ASADP results to the full useful life mileage may be satisfactory if actual data at this mileage is unavailable.

4. Severity of the ASADP

The two sets of data discussed above (the in-use data and the ASADP data) should be compared. For the ASADP to be acceptable, the comparison should show that the ASADP will result in the same, or more deterioration than the in-use data in a significant majority of the cases.

Manufacturers should provide an estimate of the percent of in-use vehicles expected to have in-use emission deterioration equal to or less than that predicted by the ASADP (the severity level of the ASADP) and the method used to determine the severity level. EPA requires that

ASADPs be severe enough to assure that ASADP procedures will result in certification DFs at least as severe as in-use DFs.

At this time, EPA does not require ASADPs to meet a specific minimum severity level (or confidence level) because different methods may be used to estimate the degree of severity. For example, one ASADP which was designed to the 75th percentile severity level may equate to another ASADP designed to the 95th percentile severity, depending on the method used to define the severity levels, the types of ASADP's involved, and the history of in-use compliance for the manufacturers involved, etc. However, an ASADP would be acceptable to EPA if EPA believes that it were designed to match the in-use deterioration of 90-95 percent of vehicles in the engine family.

Please note that EPA's approval criteria is not simply that the ASADP is more severe than EPA's existing standard (AMA) mileage accumulation durability program. The ASADP must be designed to generate DFs representative of in-use DFs.

5. Catalyst Temperature Data

Two types of catalyst temperature data are required, "up-front" catalyst data and catalyst "thumbprint" data. "Up-front" catalyst temperature data should be supplied on several engine

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families, covering the breadth of the engine families utilizing ASADPs. It should be submitted prior to EPA approval of the ASADP. Catalyst "thumbprint" data is required for each engine family certified via the ASADP program, and may be submitted after receiving EPA's general approval of the ASADP.

5.1 Up-front Catalyst Temperature Data:

Prior to ASADP approval, manufacturers should supply catalyst temperature data for several vehicles covering the breadth of the engine families utilizing an ASADP. The data supplied should include catalyst temperature data comparing the maximum catalyst bed temperatures which occur on the vehicles when operated on both the AMA (70 mph) cycle and the manufacturer's ASADP procedure. Manufacturers should supply a brief description of how that data was generated, including the type of vehicle operation (chassis dynamometer or road data), type of dynamometer, vehicle weight, vehicle loading, the

ambient temperature, the type of dynamometer cooling, and any other pertinent information).

5.2 Catalyst Thumbprint Data:

Prior to certification of each engine family utilizing the alternative durability process, the manufacturer should submit a histogram of maximum catalyst bed temperatures for some period of stabilized vehicle operation on both the current AMA (70 mph) and the ASADP. This data will be used as a "thumbprint" to assist EPA in future decision-making (e.g. carryover, corrective actions, etc.).

5.3 Format of the Catalyst Temperature Data:

The catalyst temperature data submittal should include actual time at temperature data, in table form. The table should include the catalyst temperature in "hours" necessary to complete 100,000 miles on each cycle. EPA prefers that the table contain one column with increments of 25 C (e.g. from 301 C to 325 C, 326 C to 350 C,, 976 C to 1000 C); one column with the number of hours the catalyst would spend in each temperature band when driven 100K miles over the AMA (70 mph) cycle, and one column with the number of hours the catalyst would spend in each temperature band when driven or aged for 100K miles using the manufacturer's ASADP procedures.

6. Component Durability Demonstration

Prior to certification, EPA requires manufacturers using the alternative durability program to show "to the Administrator's satisfaction that all emission-related components are designed to operate properly for the durability useful life of the vehicles in actual use (or such shorter intervals as permitted in section

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86.094.25)".¹ For each ASADP engine family, the manufacturer should submit a plan to demonstrate component durability for that engine family. Sources of data for component durability are defect reports, bench testing of components, and other similar data.

7. Documentation

7.1 Written Agreement:

The provisions of 40 CFR 86.094-13(e)(8)(i) require the elements of an ASADP to be consolidated into a written "agreement" documenting the details of the ASADP for each engine family. The agreement should contain the information required by 40 CFR 86.094-13(e)(1) through (8) including a detailed description of the method of aging emission-control system components, the method of determining DFs, the in-use vehicle recruitment procedures, in-use vehicle screening procedures, and in-use vehicle testing procedures. A copy of the agreement must be included in the application for certification.

7.2 Changes to the Written Agreement:

Prior to certification, EPA must be informed in writing in a timely manner (e.g. within 60 days) when changes are made to the ASADP agreement. After certification, the provisions of 40 CFR 86.094-13(e)(8)(ii) require advance EPA approval when making changes to the ASADP agreement (including changes to the procurement practice for the test vehicles).

8. Carryover

EPA is still evaluating the carryover issues associated with ASADPs, for both the reality check data and durability data. The Agency will consider carryover of the DF data and the reality check separately. Carryover of DF data will be considered on a case-by-case basis using criteria similar to the policies in Advisory Circular 17F. However, EPA expects that there will be cases where EPA would allow a DF carryover but still require a supplemental or a full in-use reality check.

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¹40 CFR 86.094-13(e)(7)(ii)

ALTERNATIVE DURABILITY PROCESS
OUTLINE OF AN ACCEPTABLE REALITY CHECK PROGRAM

1. Size and Composition of the Test Sample

- a. A minimum of 5 test vehicles are tested in each of the 2nd, 3rd and 4th years of customer service. EPA will delay its analysis and require fifth year vehicles only if the 2nd to 4th year data is inconclusive.
- b. The product-line within each engine family is divided into configuration classifications based on the parameters of car line, ETW, transmission configuration, engine code and final drive (or axle) ratio.
- c. The vehicle test sample (5 minimum) is distributed proportionally according to the sales of each of the configurations. For example:

Config. 1	45% sales	Two test vehicles
Config. 2	25% sales	One test vehicle
Config. 3	15% sales	One test vehicle
Config. 4	10% sales	One test vehicle
Config. 5	5% sales	Not included
- d. EPA reserves the right to substitute one vehicle of our choice, if we feel that the test fleet does not adequately cover the engine family.
- e. The manufacturer must submit to EPA a preliminary in-use test fleet prior to certification. Configurations (fleet composition) are determined by the manufacturer based on projected sales during the certification process. A final test fleet based on actual sales must be submitted to EPA prior to the start of the reality check test program.
- f. Composition of the reality test fleet requires EPA approval.
- g. The same test sample configurations must be tested each year but repeat testing of the same vehicle is not permitted.

2. Procurement of Test Vehicles

- a. Customer vehicles are to be selected randomly from available registration lists. Other vehicle reference sources may be

used with EPA approval.

- b. Manufacturer employee vehicles and all fleet vehicles are ineligible to participate
- c. EPA prefers (but does not require) that a manufacturer coordinates procurement and vehicle pretest screening through a contractor.
- c. Manufacturers may ask customers questions which evaluate a vehicle for abuse, tampering, or major engine/catalyst repairs. Maintenance should not be discussed. A manufacturer's proposed questionnaire must be approved by EPA. Refer to Attachment III for a sample questionnaire.

3. Rejecting Recruited Test Vehicles Prior to Test

- a. All tests are to be performed on the in-use vehicle in its "as-received" condition, except as discussed below.
- b. Vehicles may be rejected from the test sample in cases where there are safety considerations with conducting the test; obvious indications of gross misuse, tampering, and odometer problems; indications of extensive collision damage or major engine repair; and/or a history of towing heavy loads.
- c. If the manufacturer wishes to reject a recruited vehicle prior to testing, EPA permission must first be obtained.

4. Target Mileage Intervals for Test Vehicles

- a. EPA must approve the manufacturer's proposed recruitment mileage ranges for each test year. The ranges for each year typically overlap 10K miles. Suggested mileage intervals that EPA would approve:
 - 2nd year of customer service -10-30K miles
 - 3rd year of customer service -20-50K miles
 - 4th year of customer service -40-70K miles

If testing is continued for the 5th year, the upper limit of the mileage interval would extend to 100K miles.

- b. Each vehicle configuration represented in the test fleet must

be tested within the specified mileage intervals of each test year. For conditions where specific configurations are difficult to procure, the manufacturer may petition EPA for a deviation.

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5. Emission Test Measurements

- a. All individual vehicle test data, including void tests, must be submitted to EPA.
- b. Each tailpipe FTP emission test must be conducted using EPA certification-quality test procedures, e.g. using pre-loaded canister test procedures if the engine family is certified using those test procedures.
- c. The test facility must have documentation showing reasonable correlation results with EPA.
- d. Double preconditioning cycles may be performed prior to each FTP.
- e. If a bench-type durability process is used, engine-out emissions must be measured on a number of in-use test vehicles. The number of vehicles tested for engine-out emissions is the result of mutual agreement between the manufacturer and EPA. Tailpipe emissions are to be adjusted for the extraction of the engine-out flow loss. Engine-out emission test requirements are not applicable to ASADP whole vehicle programs.

6. Allowed Maintenance and Retests

- a. After the as-received test is conducted, the manufacturer may conduct additional testing (retests) or perform restorative maintenance and perform post-maintenance tests (after-maintenance tests).
- b. If the test vehicle's OBD system indicates that maintenance

is required, before-maintenance and after-maintenance tests should be conducted unless the before-maintenance test would result in vehicle damage or a safety hazard. Based on the kind of maintenance performed, EPA may approve or disallow the use of the after maintenance test data.

- c After the as-received test, if the manufacturer has strong reason to believe that the test vehicle was unrepresentative, they may investigate by performing standard diagnostic procedures, perform the indicated diagnostic maintenance, and conduct additional FTP tests.
- d. Normal diagnostic procedures (as contained in the service manual) should be followed in these investigations.
- e. EPA will not evaluate these cases while the testing or

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maintenance is underway. Manufacturers should proceed using their best engineering judgement and document their findings and decisions.

- f. Engineering reports should be submitted to EPA discussing the reason(s) why the as-received test was unrepresentative, the diagnostics and maintenance performed, and justification as to whether the before or after test or the average of the two should be used in subsequent data analyses. EPA will make the final decision as to which test data will be used.

7. Post test Rejections

- a. The emission test results from vehicles which represent statistical outliers may be rejected, provided such rejected vehicles are documented in the final report.
- b. Consistent outlier treatment should be used for all ASADP engine families.
- c. Data from rejected vehicles must be replaced with data on the same vehicle configuration and the same mileage/age window (so that data are submitted on a minimum of five vehicles for each year of the reality check). Carryover vehicles may be used to supply this replacement data. Exceptions may be

allowed with prior EPA approval.

8. Small Volume Engine Families

- a. Small volume engine families may require special recruitment criteria for the in-use testing. These engine families will be handled on basis.
- b. Manufacturers should work with EPA to define a "small volume ASADP engine family" and to develop in-use reality check procedures for these families.

9. Data Submissions

- a. For each engine family, manufacturers should present EPA with an annual report of activity for each year of testing. The report shall be submitted to the EPA within a reasonable time after the completion of the yearly test sample for each engine family.

- b. The annual report should contain:

- . All test data, including void test data, before

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and after maintenance tests, etc.;

- . The test procedure used, including the method of canister pre-conditioning;
 - . A description of each test vehicle, including the VIN, odometer, test date, and any other pertinent comments or information;
 - . A summary of test vehicles rejected after procurement, including the date of EPA approval;
 - . Any engineering reports required;
 - . A list of occurrences of OBD light illumination and the stored service codes; and
 - . A tally of the reasons that prospective vehicles were rejected from recruitment due to questionnaire topics.
- c. The final report should contain the manufacturer's analysis of the reality check data and the determination of "pass" or "fail". The report should discuss the manufacturer's methods of analyzing the data and any remedial action the

manufacturer intends to take. This final report should contain plots of emission results as a function of miles and a statistical analysis of the emission data results.

10.Data Analysis and Remedial Action

- a. EPA has not decided upon the methods it will use to evaluate the reality check data.
- b. For the present, we will allow manufacturers to calculate compliance using their methods as long as the manufacturers understand that EPA will conduct its own analysis.
- c. The methods that EPA intends to use are being developed in the RDP-II rulemaking activity. EPA intends to use similar procedures to analyze data collected under RDPI rules to the extent practicable.
- d. It is likely that EPA's analysis will consider the following information:
 - . A comparison of the slope of the in-use reality check DF line and the durability DF line or the DF itself;
 - . A statistical comparison of the 100K and 50K in-use least squares emission value and the certification standard (that is, "linecrossing");
 - . Trend data of reality check data from other families which used the same procedures; and
 - . The compliance level of the individual in-use

validation data points compared to the certification emission standards.

- e. Based on EPA's analysis of the data for each specific engine family and the trend data for all ASADP engine families, EPA may require the manufacturer to improve their ASADP process.
- f. EPA expects to use the performance of on-going and previous ASADPs to determine the appropriateness of a manufacturer's

participation in future ASADPs.

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**ALTERNATIVE DURABILITY PROCESS
SAMPLE IN-USE VEHICLE SCREENING QUESTIONNAIRE**

VEHICLE DESCRIPTION:

MODEL YEAR AND NAME

VIN

ODOMETER READING

REGISTERED OWNER INFORMATION:

NAME

ADDRESS

REJECTION CRITERIA CHECK LIST:

1. Odometer reading outside required range
2. Inoperative odometer or history thereof
3. History of extensive collision damage
4. Damaged, wrong size, or excessively worn tires*
5. Ominous engine noise or serious fluid leaks from engine or transmission
6. Leaking exhaust system
7. Catalytic converter replaced or missing
8. History of towing heavy loads (passenger cars only)
9. History of major engine repair such as piston, crankshaft, cylinder head or engine block replacement
10. Presence of non-original performance equipment or history of use in competitive motor sports
11. Others, with prior EPA approval

*If mfr. plans to use slave tires, this criteria does not apply

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